SECTION C — (3 × 10 = 30 marks)

Answer any THREE questions.

16. From the following table, find the value of x for which $f(x)$ is maximum. Also find the maximum value of $f(x)$ from the table of values given below.

x	60	75	90	105	120
$f(x)$	28.2	38.2	43.2	4.9	37.7

17. Evaluate $\int_{-3}^{3} x^4 dx$ by using

(a) Trapezoidal rule

(b) Simpson's rule.

18. Solve $y_{x+2} - 7y_{x+1} - 8y_x = x(x-1)2^x$.

19. Solve $\frac{dy}{dx} = x + y$, $y(0) = 1$. Obtain the values of $y(0.1), y(0.2)$ using Picard's method and check your answer with the exact solution.

20. Compute $y(0.3)$ given $\frac{dy}{dx} + y + xy^2 = 0$, $y(0) = 1$ by taking $h = 0.1$ using R.K. method of fourth order.

NOVEMBER/DECEMBER 2024

23UEAI22A/23UECS22A/23UEDA22B/ 23UEI22A/23UEMA23/23UESC22A — NUMERICAL METHODS — II

Time : Three hours Maximum : 75 marks

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SECTION A — (10 × 2 = 20 marks)

Answer ALL the questions.

1. What is the equation for getting extremum values of y?

2. What is the formula for $\left(\frac{d^3y}{dx^3}\right)_{x=x_n}$?

3. Evaluate $\int_0^1 \frac{dx}{1+x^2}$ using Trapezoidal rule with $h = 0.2$.

4. What is the truncation error in Simpson's rule?

5. From the difference equation by eliminating a and b from the relation $y = (a + bx).2^x$.

6. Solve $y_{x+3} - 2y_{x+2} - y_{x+1} + 2y_x = 0$.

7. State the Picard's iteration formula.

8. What is the truncation error for Taylor series?

9. Write the formula for modified Euler method.

10. What is difference between Euler and modified Euler Method?

SECTION B — (5 × 5 = 25 marks)

Answer ALL the questions.

11. (a) Find the first two derivatives of $f(x)$ at $x = 50$ and $x = 56$ given the table below by using Newton's forward formula.

x	50	51	52	53	54	55	56
y	3.6840	3.7084	3.7325	3.7563	3.7798	3.8030	3.8259

Or

(b) Given the following data, find $y'(6)$ and the maximum value of y.

x	0	2	3	4	7	9
y	4	26	58	112	406	922

12. (a) Evaluate $\int_0^1 \frac{dx}{1+x^2}$ using Trapezoidal rule with $h = 0.2$. Hence obtain an approximate value of x. can you use other formulae in this case.

Or

(b) Evaluate the integral $\int_4^{5.2} \log_e x\,dx$ using Weddle's rule.

13. (a) Solve $y_{x+2} - y_{x+1} + y_x = 0$ given $y_0 = 1$, $y_1 = \frac{\sqrt{3}+1}{2}$.

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Or

(b) Solve $u_{x+2} + u_x = \sin x$.

14. (a) Using Taylor series method, find correct to four decimal places, the value of $y(0.1)$, given $\frac{dy}{dx} = x^2 + y^2$ and $y(0) = 1$.

Or

(b) Derive the Picards method.

15. (a) Using Euler's method, solve numerically the equation, $y' = x + y$, $y(0) = 1$, for $x = 0.2, 0.4, 0.6$.

Or

(b) Compute y at $x = 0.25$ by modified Euler's method given by $y' = 2xy$; $y(0) = 1$.